

WHAT IS CLAIMED IS:

1. A method for calibrating a production printing cartridge for use in an imaging system, comprising the steps of:
 - obtaining first standard cartridge signature color data associated with a standard printing cartridge and a first substrate;
 - 5 obtaining second standard cartridge signature color data associated with said standard printing cartridge and a second substrate;
 - obtaining first production cartridge signature color data associated with said production printing cartridge and said first substrate; and
 - estimating second production cartridge signature color data associated with
 - 10 said production printing cartridge and said second substrate based on said first standard cartridge signature color data, said second standard cartridge signature color data, and said first production cartridge signature color data.
2. The method of claim 1, wherein said obtaining said first standard cartridge signature color data includes:
 - printing a first plurality of test patches using said first substrate and said standard printing cartridge; and
 - 5 measuring said first plurality of test patches to obtain said first standard cartridge signature color data.
3. The method of claim 1, wherein said obtaining said second standard cartridge signature color data includes:
 - printing a second plurality of test patches using said second substrate and said standard printing cartridge; and
 - 5 measuring said second plurality of test patches to obtain said second standard cartridge signature color data.
4. The method of claim 1, wherein said obtaining said first production cartridge signature color data includes:
 - printing a third plurality of test patches using said first substrate and said production printing cartridge; and

- 5 measuring said third plurality of test patches to obtain said first production cartridge signature color data.

5. The method of claim 1, wherein said first substrate is different from said second substrate.

6. The method of claim 1, wherein:

said first substrate is calibration paper, and

- 5 said second substrate is one of the group consisting of plain paper, photo quality paper, iron-on-transfer material, coated paper, back-lit film, greeting card stock, transparency material, and fabric.

7. The method of claim 1, wherein said imaging system includes an imaging apparatus, further comprising the steps of:

- 5 storing said first standard cartridge signature color data and said second standard cartridge signature color data into a memory accessible by said imaging system,

installing said production printing cartridge into said imaging apparatus; and

retrieving said first standard cartridge signature color data and said second standard cartridge signature color data from said memory.

8. The method of claim 1, further comprising the step of:

generating a signature color data lookup table based on said second production cartridge signature color data.

9. The method of claim 8, wherein said imaging system includes an imaging apparatus accessing a standard color conversion lookup table, further comprising the step of:

- 5 combining said signature color data lookup table with said standard color conversion lookup table to generate a composite color conversion lookup table for use in printing with said production printing cartridge on said second substrate.

10. The method of claim 9, further comprising the steps of:
storing said first production cartridge signature color data in a memory
accessible by said imaging system;
installing said production printing cartridge into said imaging apparatus; and
5 retrieving said first production cartridge signature color data from said
memory.

11. The method of claim 10, wherein said memory is a cartridge memory of
said production printing cartridge.

12. The method of claim 10, wherein said memory is an offsite memory
accessed using a network.

13. The method of claim 1, comprising the further steps of:
determining a lightness ratio from said first standard cartridge signature color
data and said second standard cartridge signature color data;
determining a chroma ratio from said first standard cartridge signature color
5 data and said second standard cartridge signature color data; and
determining a hue angle difference from said first standard cartridge signature
color data and said second standard cartridge signature color data,
wherein said estimating said second production cartridge signature color data
is based on said lightness ratio, said chroma ratio, and said hue angle difference.

14. The method of claim 13, wherein said second production cartridge
signature color data is based on scaling each of said lightness ratio, said chroma ratio,
and said hue angle difference.

15. The method of claim 13, wherein:
said lightness ratio is determined for a first input point in a colorspace using a
lightness ratio function, said chroma ratio is determined at said first input point using
a chroma ratio function, and said hue angle difference is determined at said first input
5 point using a hue angle difference function; and

said second production cartridge signature color data is based on evaluating at a second input point in said colorspace each of said lightness ratio function, said chroma ratio function, and said hue angle difference function.

16. The method of claim 15, wherein:

a first signature color data component is determined based on scaling each of said lightness ratio, said chroma ratio, and said hue angle difference;

5 a second signature color data component is based on evaluating at said second point in said colorspace each of said lightness ratio function, said chroma ratio function, and said hue angle difference function; and

said second production cartridge signature color data is based on a weighted average of said first signature color data component and said second signature color data component.

17. An imaging apparatus, comprising:

a print engine configured to mount a production printing cartridge; and

a controller communicatively coupled to said print engine, said controller executing instructions to perform the steps of:

5 acquiring first standard cartridge signature color data associated with a standard printing cartridge and a first substrate;

acquiring second standard cartridge signature color data associated with said standard printing cartridge and a second substrate;

10 acquiring first production cartridge signature color data associated with said production printing cartridge and said first substrate; and

estimating second production cartridge signature color data associated with said production printing cartridge and said second substrate based on said first standard cartridge signature color data, said second standard cartridge signature color data, and said first production cartridge signature color data.

18. The imaging apparatus of claim 17, wherein said first substrate is different from said second substrate.

19. The imaging apparatus of claim 17, wherein:

said first substrate is calibration paper, and

said second substrate is one of the group consisting of plain paper, photo
quality paper, iron-on-transfer material, coated paper, back-lit film, greeting card
5 stock, transparency material, and fabric.

20. The imaging apparatus of claim 17, said controller further executing
instructions to perform the step of:

generating a signature color data lookup table based on said second production
cartridge signature color data.

21. The imaging apparatus of claim 20, said controller also accessing a
standard color conversion lookup table and further executing instructions to perform
the step of:

combining said signature color data lookup table with said standard color
5 conversion lookup table to generate a composite color conversion lookup table for use
in printing with said production printing cartridge on said second substrate.

22. The imaging apparatus of claim 17, wherein said estimating step is
performed by:

using a lightness ratio based on said first standard cartridge signature color
data and said second standard cartridge signature color data;

5 using a chroma ratio based on said first standard cartridge signature color data
and said second standard cartridge signature color data; and

using a hue angle difference based on said first standard cartridge signature
color data and said second standard cartridge signature color data,

wherein said estimating said second production cartridge signature color data
10 is based on said lightness ratio, said chroma ratio, and said hue angle difference.

23. The imaging apparatus of claim 22, wherein said estimating said second
production cartridge signature color data is based on scaling each of said lightness
ratio, said chroma ratio, and said hue angle difference.

24. The imaging apparatus of claim 22, wherein:

said lightness ratio is determined for a first input point in a colorspace using a lightness ratio function, said chroma ratio is determined at said first input point using a chroma ratio function, and said hue angle difference is determined at said first input
5 point using a hue angle difference function; and

said second production cartridge signature color data is based on evaluating at a second input point in said colorspace each of said lightness ratio function, said chroma ratio function, and said hue angle difference function.

25. The imaging apparatus of claim 24, wherein in said estimating said second production cartridge signature color data:

a first signature color data component is determined based on scaling each of said lightness ratio, said chroma ratio, and said hue angle difference;

5 a second signature color data component is based on said evaluating at said second input point in said colorspace each of said lightness ratio function, said chroma ratio function, and said hue angle difference function; and

said second production cartridge signature color data is based on a weighted average of said first signature color data component and said second signature color
10 data component.

26. The imaging apparatus of claim 22, said imaging apparatus further comprising an imaging driver, wherein said imaging driver includes said first standard cartridge signature color data and said second standard cartridge signature color data, and wherein said acquiring said first standard cartridge signature color data and said
5 acquiring said second standard cartridge signature color data includes generating said lightness ratio, generating said chroma ratio, and generating said hue angle difference.

27. The imaging apparatus of claim 22, said imaging apparatus further comprising an imaging driver, wherein:

said imaging driver includes said lightness ratio, said chroma ratio, and said hue angle difference,

5 wherein said acquiring said first standard cartridge signature color data and said acquiring said second standard cartridge signature color data includes accessing

said lightness ratio, accessing said chroma ratio, and accessing said hue angle difference.

28. The imaging apparatus of claim 17, wherein a memory accessible by said imaging apparatus stores said first production cartridge signature color data, and wherein said acquiring said first production cartridge signature color data includes retrieving said first production cartridge signature color data from said memory.

29. The imaging apparatus of claim 28, wherein said memory is a cartridge memory of said production printing cartridge.

30. The imaging apparatus of claim 28, wherein said memory is an offsite memory accessed using a network.